

Could ancient Egyptians hold the key to 3D printed ceramics?

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(Phys.org)—A 7,000 year old technique, known as Egyptian Paste (also known as Faience), could offer a potential process and material for use in the latest 3D printing techniques of ceramics, according to researchers at UWE Bristol.

Professor Stephen Hoskins, Director of UWE's Centre for Fine Print Research and David Huson, Research Fellow, have received funding from the [Arts and Humanities](#) Research Council (AHRC) to undertake a major investigation into a self-glazing 3D printed ceramic, inspired by ancient Egyptian Faience ceramic techniques. The process they aim to develop would enable ceramic artists, designers and craftspeople to print [3D objects](#) in a [ceramic material](#) which can be glazed and vitrified in one firing.

The researchers believe that it possible to create a contemporary 3D printable, once-fired, self-glazing, non-plastic ceramic material that exhibits the characteristics and quality of Egyptian Faience.

Faience was first used in the 5th Millennium BC and was the first glazed ceramic material invented by man. Faience was not made from clay (but instead composed of quartz and alkali fluxes) and is distinct from Italian Faience or Majolica, which is a tin, glazed earthenware. (The earliest Faience is invariably blue or green, exhibiting the full range of shades between them, and the colouring material was usually copper). It is the self-glazing properties of Faience that are of interest for this research project.

Current research in the field of 3D printing concentrates on creating [functional materials](#) to form physical models. The materials currently used in the 3D printing process, in which layers are added to build up a 3D form, are commonly: UV polymer resins, hot melted 'abs' plastic and inkjet binder or laser sintered, powder materials. These techniques have previously been known as rapid prototyping (RP). With the advent of better materials and equipment some RP of real materials is now possible. These processes are increasingly being referred to as solid 'free-form fabrication' (SFF) or additive layer manufacture. The UWE research team have focused previously on producing a functional, printable clay body.

This three-year research project will investigate three methods of glazing used by the ancient Egyptians: 'application glazing', similar to modern glazing methods; 'efflorescent glazing' which uses water-soluble salts; and 'cementation glazing', a technique where the object is buried in a glazing powder in a protective casing, then fired. These techniques will be used as a basis for developing contemporary printable alternatives

Professor Hoskins explains, "It is fascinating to think that some of these

ancient processes, in fact the very first glazed ceramics ever created by humans, could have relevance to the advanced printing technology of today. We hope to create a self-glazing 3D printed ceramic which only requires one firing from conception to completion rather than the usual two. This would be a radical step-forward in the development of [3D printing](#) technologies. As part of the project we will undertake case studies of craft, design and fine art practitioners to contribute to the project, so that our work reflects the knowledge and understanding of artists and reflects the way in which artists work."

The project includes funding for a three-year full-time PhD bursary to research a further method used by the Egyptians, investigating coloured 'frit', a substance used in glazing and enamels. This student will research this method, investigating the use of coloured frits and oxides to try and create as full a colour range as possible. Once developed, this body will be used to create a ceramic extrusion paste that can be printed with a low-cost 3D printer. A programme of work will be undertaken to determine the best rates of deposition, the inclusion of flocculants and methods of drying through heat whilst printing.

This project offers the theoretical possibility of a printed, single fired, glazed ceramic object - something that is impossible with current technology.

Provided by University of the West of England

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